

**RTCA Special Committee 186, Working Group 3**

**ADS-B 1090 MOPS, Revision A**

**Meeting # 13, 20-22 August 2002**

**Overlooked Requirements**

**Presented by James Maynard**

<b>SUMMARY</b>
<p>In DO-260, requirements were generally marked by the use of the word “shall” and in DO-260A, we have agreed to further mark requirements by displaying that word in boldface font. I have noticed some “implied” requirements that should have been explicitly stated in DO-260, but were not. This paper proposes text for DO-260A to make those requirements explicit.</p> <p>As I struggled to find appropriate places in the document to insert these requirements, I found what seemed to me to be organizational problems. So this paper also proposes to move some existing subparagraphs from one place in the document to another.</p>

Section	Changes
§2.2.3.2.1	<p>ADS-B messages <b>shall</b> use extended squitter formats in which DF = 17, or in which DF = 18 and CF = 0 or 1, or in which DF = 19 and AF = 0. However, the DF = 19 format is reserved for military applications; non-military ADS-B participants <b>shall not</b> transmit extended squitter formats in which DF = 19.</p> <p>ADS-B receiving subsystems <b>shall not</b> process as ADS-B messages those extended squitter formats for which</p> <ul style="list-style-type: none"> <li>(a) DF is not in the range 17 to 19, or</li> <li>(b) DF = 18 and CF ≠ 0, or</li> <li>(c) DF = 19 and AF ≠ 0.</li> </ul> <p>ADS-B receiving subsystems on non-military aircraft are not required to process those extended squitter formats for which DF = 19 and AF = 0, but may do so.</p>
§2.2.3.2.1	This section was formerly titled “ADS-B Message Format Structure” and is now proposed to be titled “Baseline Message Fields,” with subsections to describe the DF, CA/CF/AF, AA, ME, and PI fields.
§2.2.3.2.1.1	Description of DF field, moved from the former §2.2.3.2.1.1.4. Some minor changes, including mentioning TIS-B messages as well as ADS-B messages for the DF=18 case.
§2.2.3.2.1.2	Description of the CA (transponder capability) field, moved from the former §2.2.3.2.1.1.2.
§2.2.3.2.1.3	Description of the CF field, moved from former §2.2.3.2.1.1.2. Describes only the CF field (rather than both the CF and AF fields), and includes reference to TIS-B messages as well as to ADS-B messages.
§2.2.3.2.1.4	Description of the AF field, moved from former §2.2.3.2.1.1.2.
§2.2.3.2.1.5	Description of the AA field, moved from former §2.2.3.2.1.1.1. Added <a href="#">Figure 2-2.15</a> to specify the type of address in the AA field, depending on the values in the DF field, the CF or AF field, and – for TIS-B messages -- the IMF subfield of the ME field..
§2.2.3.2.1.6	Overall description of the “ME” field in ADS-B and TIS-B extended squitter messages. The first paragraph is moved from the former §2.2.3.2.1.1.4. The second paragraph mentions the TYPE and SUBTYPE subfields that determine the particular ADS-B or TIS-B message type, and refers to §2.2.3.2.2, where those subfields are described further.
§2.2.3.2.1.6	Description the PI field, moved from former §2.2.3.2.1.1.6. Modified the <i>Note</i> .
§2.2.3.2.2	<p>Description of the “TYPE” and “SUBTYPE” subfields of the “ME” field in ADS-B and TIS-B messages.</p> <p>Two new tables, <a href="#">Figure 2-2.2-A</a> and <a href="#">Figure 2-2.2-B</a>, are introduced to show how the ADS-B and TIS-B message types are determined. depending on the values in the TYPE subfield and the SUBTYPE subfield, if it is present. Explicit requirements (marked with “<b>shall</b>” and “<b>shall not</b>”) are introduced, referencing those tables, to specify which ADS-B and TIS-B messages are to be transmitted by ADS-B or TIS-B transmitting subsystems and received by ADS-B or TIS-B receiving subsystems.</p>
§2.2.3.2.3.1	The overall description of the TYPE and SUBTYPE subfields having been moved to §2.2.3.2, this subparagraph under the description of the ADS-B Airborne Position message can now be confined to describing only the TYPE subfield in ADS-B Airborne Position messages. Therefore, <a href="#">Figure 2-2.3.1</a> (the former <a href="#">Table 2-11</a> ) only describes the meaning of TYPE subfield values in ADS-B Airborne Position or Surface Position messages. The information about other Type Codes for other ADS-B Messages has been moved to <a href="#">Figure 2-2.2</a> in §2.2.3.2.2.

### 2.2.3.2 ADS-B and TIS-B Baseline Format Structure

Table 2.2.3.2 shows the overall format structure that **shall** be used for ADS-B and TIS-B messages. The first 5 data bits in each transmission are called the DF (Downlink Format) field, while the following three bits are called the CA field if DF = 17, the CF field if DF = 18, or the AF field if DF = 19.

**Table 2.2.3.2: Overall ADS-B and TIS-B Message Format.**

ADS-B AND TIS-B OVERALL MESSAGE FORMAT STRUCTURES					
Bit # ®	1 (MSB) (LSB) 5	6 (MSB) (LSB) 8	9 (MSB) (LSB) 32	33 (MSB) (LSB) 88	89 (MSB) (LSB) 112
<b>DF = 17 Field Names ®</b>	DF = 17 [5]	CA [3]	AA ICAO Address [24]	ADS-B Message ME Field [56]	PI [24]
<b>DF = 18 Field Names ®</b>	DF = 18 [5]	CF = 0 [3]	AA ICAO Address [24]	ADS-B Message ME Field [56]	PI [24]
		CF = 1 [3]	AA non-ICAO Address [24]		
		CF = 2 to 4 [3]	AA [24]	TIS-B Message ME Field [56]	PI [24]
		CF = 5 to 7	Reserved		PI [24]
<b>DF = 19 Field Names®</b>	DF = 19 [5]	AF = 0 [3]	AA ICAO Address [24]	ADS-B Message ME Field [56]	PI [24]
		AF = 1 to 7 [3]	Reserved for Military Applications		

*Notes for Table 2.2.3.2:*

1. “[#]” provided in a field indicates the number of bits in the field.
2. DF = 19 messages are intended for Military Applications systems only.
3. For DF=19, if the AF field is equal to 0, then bits 9-32 are used for the AA field, bits 33-88 are used for the ME field, and bits 89-112 are used for the PI field. If the AF field is not 0 (that is, is in the range 1 to 7) then bits 9-112 are used for the “Reserved for Military Applications” field. (This format is reserved for military use only.)

The DF = 17 format is used for ADS-B messages from Mode S transponders. If DF = 17, the CA field describes the capabilities of the Mode S transponder, the AA field holds the transponder’s 24-bit ICAO address, the ME field holds the body of the ADS-B message, and the PI field holds parity check bits.

The DF = 18 format is used for ADS-B or TIS-B messages from transmitting devices that are not Mode S transponders. If DF = 18, the 3-bit DF (Code Format) field designates whether the ME field holds an ADS-B message or a TIS-B message. For DF = 18 transmissions in which CF = 0 or 1 (that is, DF=18 extended squitters that carry ADS-B messages), the CF field also specifies what type of address is contained in the AA field.

ADS-B messages **shall** use extended squitter formats in which DF = 17, or in which DF = 18 and CF = 0 or 1, or in which DF = 19 and AF = 0. The DF = 19 format is reserved for military applications; non-military ADS-B participants **shall not** transmit extended squitter formats in which DF = 19.

ADS-B receiving equipment **shall** accept and process as ADS-B messages any extended squitter transmissions in which DF = 17, or in which DF = 18 and CF = 0 or 1. ADS-B receiving equipment may accept and process ADS-B messages in which DF = 19 and AF = 0, but need not do so. ADS-B receiving equipment **shall not** process as ADS-B messages any extended squitter receptions in which DF = 18 and CF is not 0 or 1, or any extended squitter receptions in which DF = 19 and AF is not 0.

TIS-B messages **shall** use extended squitter formats in which DF = 18 and CF is in the range from 2 to 4. TIS-B receiving equipment **shall not** process as TIS-B messages any extended squitter receptions in which DF ≠ 18 or in which CF is not in the range from 2 to 4.

#### 2.2.3.2.1 Baseline Message Fields

The following subparagraphs describe the fields that were listed in Table 2.2.3.2 above.

##### 2.2.3.2.1.1 “DF” Downlink Format Field <<Moved from former §2.2.3.2.1.1.4>>

- a. The “DF” field is the first field in all downlink formats and provides the transmission descriptor coded in accordance with RTCA Document DO-181B, Figure 2-5 (EUROCAE ED-73A, Figure 3-4).
- b. The “DF” field **shall** be set to DF=17 (1 0001 binary) for all ADS-B Message transmissions from Mode-S transponder based transmission devices.
- c. The “DF” field **shall** be set to DF=18 (1 0010 binary) for all ADS-B Message transmissions from transmission devices that are not Mode-S transponder based systems and for all TIS-B message transmissions.
- d. The “DF” field **shall** be set to DF=19 (1 0011 binary) for all ADS-B Message transmissions from transmission devices that are Military Application based systems.

**Note:** *Encoding of the “DF” field is consistent with section 3.1.2.3.2 and Figure 3-8 in ICAO ANNEX 10, Volume IV, Second Edition, July 1998.*

### 2.2.3.2.1.2 “CA” Capability Field (used in DF=17) <<Moved from former §2.2.3.2.1.1.2>>

- a. **Definition:** -- The “CA” field is a 3-bit (bits 6 through 8) field used to report the capability of an ADS-B transmitting installation that is based on a Mode S transponder. For the most part, the “CA” field is used to report the capability of a transponder and is also used in Mode-S downlink format DF=11, i.e., the Mode-S All Call reply and short squitter. Therefore, the codes used in the “CA” field are as defined in Table 2.2.3.2.1.2:

**Table 2.2.3.2.1.2: “CA” Field Code Definitions**

Coding	Meaning
0	Signifies no communications capability (surveillance only, no ability to set code 7, either on the ground or airborne
1	NOT USED
2	NOT USED
3	NOT USED
4	Signifies at least Comm-A and Comm-B capability, ability to set code 7, on the ground
5	Signifies at least Comm-A and Comm-B capability, ability to set code 7, airborne
6	Signifies at least Comm-A and Comm-B capability, ability to set code 7, either on the ground or airborne
7	Signifies “DR” field is NOT equal to zero, or “FS” field equals 2, 3, 4, 5, either on the ground or airborne.

When the conditions for Code 7 are not satisfied, installations that have communications capability but do not have automatic means to set on-the-ground condition shall use Code 6. Aircraft with automatic on-the-ground determination shall use “CA” codes 4 and 5. Data Link capability reports (RTCA Document No. DO-181B, subparagraph 2.2.17.1.12.5) (EUROCAE ED-73A, section 3.21.1.12.e) shall be available for “CA” codes 4, 5, 6 and 7.

**Notes:**

1. “CA” codes 1 to 3 were used by earlier Mode S transponders that did not use “CA” code 7.
  2. These requirements are consistent with the requirements of ICAO Annex 10, Volume IV, second edition, July 1998, section 3.1.2.5.2.2.1, as well as with the requirements of RTCA Document No. DO-181B, section 2.2.14.4.5 (EUROCAE ED-73A, section 3.18.4.5).
- b. **Transponder Use** -- The “CA” code definitions provided herein are intended for use when implemented with the Mode-S Transponder functions.

- c. Air/Ground Broadcast Format Selection: <<*I suggest that this rather detailed text be moved to later in the document, with a reference here to that later text. This would help the reader, by avoiding getting him bogged down in too deep a level of detail at a point in the document where we are just introducing the overall “baseline” extended squitter fields.*>>
- (1). If there is a means to automatically determine the vertical status of the ADS-B emitter category (as defined in 2.2.3.2.1.1.2.d), then such information shall be used to determine whether to report the Airborne Position Message (see section 2.2.3.2.3) or the Surface Position Message (see section 2.2.3.2.4).
  - (2). If there is no means to automatically determine the vertical status of the ADS-B emitter category, then the Airborne Position Message (see section 2.2.3.2.3) shall be broadcast except under the conditions given for each of the ADS-B emitter category types given in Table 2-9A. If the conditions given in Table 2-9A are met for the given ADS-B emitter category, then the Surface Position Message (see section 2.2.3.2.4) shall be broadcast.

**Table 2-9A: Determination Of Surface Position Message Broadcast  
when there is no means to automatically determine vertical status**

ADS-B Emitter Category Set “A”						
Coding	Meaning	Ground Speed		Airspeed		Radio Altitude
0	No ADS-B Emitter Category Information	Always report Airborne Position Message (see 2.2.3.2.3)				
1	Light (<15,500 lbs.)	Always report Airborne Position Message (see 2.2.3.2.3)				
2	Small (15,500 to 75,000 lbs.)	< 100 knots	<i>or</i>	< 100 knots	<i>or</i>	< 50 feet
3	Large (75,000 to 300,000 lbs.)	< 100 knots	<i>or</i>	< 100 knots	<i>or</i>	< 50 feet
4	High-Vortex Large (aircraft such as B-757)	< 100 knots	<i>or</i>	< 100 knots	<i>or</i>	< 50 feet
5	Heavy (> 300,000 lbs.)	< 100 knots	<i>or</i>	< 100 knots	<i>or</i>	< 50 feet
6	High Performance (> 5g acceleration and >400 knots)	< 100 knots	<i>or</i>	< 100 knots	<i>or</i>	< 50 feet
7	Rotorcraft	Always report Airborne Position Message (see 2.2.3.2.3) (See Note 1)				
ADS-B Emitter Category Set “B”						
Coding	Meaning	Ground Speed		Airspeed		Radio Altitude
0	No ADS-B Emitter Category Information	Always report Airborne Position Message (see 2.2.3.2.3)				
1	Glider / Sailplane	Always report Airborne Position Message (see 2.2.3.2.3)				
2	Lighter - than- Air	Always report Airborne Position Message (see 2.2.3.2.3) (See Note 2)				
3	Parachutist / Skydiver	Always report Airborne Position Message (see 2.2.3.2.3)				
4	Ultralight / hang-glider / paraglider	Always report Airborne Position Message (see 2.2.3.2.3)				
5	Reserved	Reserved				
6	Unmanned Aerial Vehicle	Always report Airborne Position Message (see 2.2.3.2.3)				
7	Space / Trans - Atmospheric vehicle	< 100 knots	<i>or</i>	< 100 knots	<i>or</i>	< 50 feet
ADS-B Emitter Category Set “C”						
Coding	Meaning					
0	No ADS-B Emitter Category Information	Always report Airborne Position Message (see 2.2.3.2.3)				
1	Surface Vehicle - Emergency Vehicle	Always report Surface Position Message (see 2.2.3.2.4)				
2	Surface Vehicle - Service Vehicle	Always report Surface Position Message (see 2.2.3.2.4)				
3	Fixed Ground or Tethered Obstruction	Always report Airborne Position Message (see 2.2.3.2.3) (See Note 3)				
4 - 7	Reserved	Reserved				
ADS-B Emitter Category Set “D”						
Coding	Meaning					
0	No ADS-B Emitter Category Information	Always report Airborne Position Message (see 2.2.3.2.3)				
1 - 7	Reserved	Reserved				

**Notes:**

1. Because of the unique operating capabilities of rotorcraft, i.e., hover, etc., an operational rotorcraft shall always report the "Airborne" state unless the "Ground" state is specifically declared in compliance with subparagraph "c.(1)" above.
2. Because of the unique operating capabilities of "Lighter-than-Air" vehicles, i.e., balloons, and operational "Lighter-than-Air" vehicle shall always report the "Airborne" State unless the "Ground" state is specifically declared in compliance with subparagraph "c.(1)" above.
3. Because of the fact that it is important for fixed ground or tethered obstructions to report altitude, such objects shall always report the "Airborne" State.

d. Validation of Ground Status:

**Note:** For aircraft with an automatic means of determining vertical status (i.e., weight-on-wheels, strut switch, etc.) the “CA” field reports whether the aircraft is airborne or on the ground. TCAS acquires aircraft using the short or long squitters, both of which contain the “CA” field. If an aircraft reports that it is on the ground, that aircraft will not be interrogated by TCAS in order to reduce unnecessary interrogation activity. The 1090 MHz ADS-B message formatter may have information available to validate that an aircraft reporting “on-the-ground” is actually on the surface.

If the automatically determined Air/Ground status is not available or indicates that the Airborne Position Message (see section 2.2.3.2.3) shall be broadcast, then the Airborne Position Message shall be broadcast in accordance with subparagraph c.

If one of the conditions in Table 2-9B is satisfied, the Air/Ground status shall be changed to “Airborne” and the Airborne Position Message (see section 2.2.3.2.3) shall be broadcast irrespective of the automatically determined Air/Ground status.

**Table 2-9B: Validation Of “ON-GROUND” Status**

AIRBORNE POSITION MESSAGE BROADCAST						
ADS-B Emitter Category Set “A”						
Coding	Meaning	Ground Speed		Airspeed		Radio Altitude
0	No ADS-B Emitter Category Information	No Change to “On-the-Ground” status				
1	Light (<15,500 lbs.)	No Change to “On-the-Ground” status				
2	Small (15,500 to 75,000 lbs.)	> 100 knots	or	> 100 knots	or	> 50 feet
3	Large (75,000 to 300,000 lbs.)	> 100 knots	or	> 100 knots	or	> 50 feet
4	High-Vortex Large (aircraft such as B-757)	> 100 knots	or	> 100 knots	or	> 50 feet
5	Heavy (> 300,000 lbs.)	> 100 knots	or	> 100 knots	or	> 50 feet
6	High Performance (> 5g acceleration and >400 knots)	> 100 knots	or	> 100 knots	or	> 50 feet
7	Rotorcraft	No Change to “On-the-Ground” status				



#### 2.2.3.2.1.3 “CF” Field (used in DF=18) <<Moved from former §2.2.3.2.1.1.3.>>

The “CF” field of DF=18 messages is a 3-bit field (bits 6 through 8) used by installations in which the ADS-B or TIS-B transmitting device is not based on a Mode S transponder. The CF field serves to classify DF=18 messages between ADS-B messages and TIS-B messages. For ADS-B messages, the CF field also specifies whether or not the AA field (§2.2.3.2.1.5) holds a 24-bit ICAO address. For TIS-B messages, the CF field serves to categorize the TIS-B message as being a “fine format” TIS-B message, a “coarse format” TIS-B airborne position and velocity message, or a TIS-B management message. The coding of the CF field **shall** be as specified in Table 2.2.3.2.1.3.

**Table 2.2.3.2.1.3: CF Field Code Definitions.**

Coding	Meaning	
0	ADS-B Message	AA field holds the transmitting ADS-B participant’s 24-bit ICAO address.
1		AA field holds another kind of address for the transmitting ADS-B participant: a self-assigned “anonymous” address, a ground vehicle address, or a surface obstruction address.
2	TIS-B Message	Fine TIS-B message.
3		Coarse TIS-B airborne position and velocity message.
4		Reserved for TIS-B management message.
5 - 7	Reserved for future standardization.	

ADS-B messages from ADS-B transmitting devices that are not based on Mode S transponders **shall** use CF = 0 or 1, according to the type of address conveyed in the AA field. TIS-B messages shall use CF = 2 or 3. CF codes of 4 through 7 are reserved for future standardization and **shall not** be transmitted by equipment that conforms to this (DO-260A) MOPS.

#### 2.2.3.2.1.4 “AF” Field (used in DF=19) <<Moved from former §2.2.3.2.1.1.3.>>

The “AF” (“Application Field”) field of DF=19 messages is a 3-bit field (bits 6 through 8) used by all ADS-B Message transmissions from transmission devices that are Military Application based systems. The coding of the AF field **shall** be as specified in Table 2.2.3.2.1.4.

**Table 2.2.3.2.1.4: “AF” Field Code Definitions**

Coding	Meaning
0	ADS-B message structure
1 - 7	Reserved for future military applications.

### 2.2.3.2.1.5 “AA” Address Field, Announced <<Moved from former §2.2.3.2.1.1>>

The “AA” field is a 24-bit (bits 9 through 32) field that **shall** contain the address of the transmitting installation in the clear. This is intended to provide unambiguous identification of the A/V being described in the ADS-B or TIS-B message.

The type of address (whether an ICAO address or some other kind of address) contained in the AA field depends on the value of the DF field, the CF or AF field if present, and the IMF (ICAO/Mode A flag) subfield of the ME field for TIS-B messages. The type of address in the AA field **shall** be as specified in Table 2.2.3.2.1.5.

**Table 2.2.3.2.1.5: Determining Type of Address in AA Field.**

DF Field	CF or AF Field	IMF Subfield	AA Field Contents
17	N/A	N/A	24-bit ICAO address of transmitting ADS-B participant.
18	CF = 0	N/A	24-bit ICAO address of transmitting ADS-B participant.
	CF = 1		Anonymous address or ground vehicle address or fixed obstacle address of transmitting ADS-B participant
	CF = 2	0	TIS-B target’s 24-bit ICAO address.
		1	TIS-B target’s 12-bit Mode A code and track file number
	CF = 3	0	TIS-B target’s 24-bit ICAO address.
		1	TIS-B target’s 12-bit Mode A code and track file number
	CF = 4 to 7	N/A	Reserved for future standardization; AA field does not necessarily exist in messages. For which DF = 18 and CF is in the range from 4 to 7.
19	AF = 0	N/A	24-bit ICAO address of transmitting ADS-B participant.
	AF = 1 to 7		Reserved for military use; AA field does not necessarily exist in messages for which DF= 19 and AF is in the range from 1 to 7.

For extended squitter transmissions in which DF = 17, or in which DF = 18 and CF = 0, or in which DF = 19 and AF = 0, the AA field **shall** contain the 24-bit ICAO address of the transmitting participant.

*Note 1: For extended squitter transmissions in which DF = 18 and CF = 1, the CF field indicates that the ME field holds an ADS-B message and that the AA field holds an address other than the standard ICAO 24-bit address of the transmitting ADS-B participant.*

*Note 2: For extended squitter transmission in which DF = 18 and CF is in the range from 2 to 4, the CF field indicates that the ME field holds a TIS-B message. In that case, the meaning of the AA field – whether or not it contains the ICAO 24-bit address of the aircraft being described in the TIS-B message – depends on the value of the CF field, as described in §TBD below.*

*Note 3: These requirements are consistent with the requirements of ICAO Annex 10, Volume IV, second edition, July 1998, section 3.1.2.5.2.2.2, as well as with the requirements of RTCA Document No. DO-181B, section 2.2.14.4.1 (EUROCAE ED-73A, section 3.18.4.1).*

The ADS-B transmitter **shall** declare a transmitter failure in the event that its own ICAO 24-bit Address is all “ZEROS” or all “ONES.”

*Note 4: This requirement is consistent with the requirements of RTCA Document No. DO-181B, section 2.2.10.3.*

#### 2.2.3.2.1.6 “ME” Field

<<This paragraph is moved from former §2.2.3.2.1.1.4.>> The “ME” field is a 56-bit field (message bits 33 through 88) that occurs in every 1090 MHz extended squitter message (that is, in every message specified in Figure 2-2). The ME field carries the bulk of the data in ADS-B and TIS-B messages.

The first five bits of the ME field comprise the TYPE subfield. For certain values of the TYPE subfield, the next three bits (“ME” bits 6 to 8) comprise a SUBTYPE subfield. The values in the TYPE subfield and, if present, the SUBTYPE subfield, determine which of several ADS-B or TIS-B messages is being conveyed in the remainder of the “ME” field. The TYPE and SUBTYPE subfields are described in §2.2.3.2.2 below.

The “ME” field formats for the various ADS-B messages are described in §2.2.3.2.3 to §TBD below: The formats for the various TIS-B messages are described in §2.2.17.3 and its subparagraphs.

#### 2.2.3.2.1.7 “PI” Parity / Identity Field << Moved from former §2.2.3.2.1.1.6.>>

The “PI” field is a 24-bit (bits 89 through 112) downlink field that contains the parity overlaid on the Code Label (“CL”) and Interrogator Code (“IC”) fields, in accordance with §2.2.14.4.22 and §2.2.16.2.1 of RTCA Document DO-181C (EUROCAE ED-73A, §3.18.4.27 and §3.20.2.1).

**Note:** *In ADS-B and TIS-B messages (those transmitted with downlink format DF=17, or with DF=18 and CF in the range from 0 to 4, or with DF=19 and AF=0) both CL = 0 and IC = 0. In other words, in ADS-B and TIS-B messages the parity is overlaid with a 24-bit pattern of ALL ZEROS.*

#### 2.2.3.2.2 Determining ADS-B and TIS-B Message Types

All ADS-B and TIS-B transmissions have the baseline structure defined in section 2.2.3.2.1. The subfields of the “ME” field are defined for each of the ADS-B message types in the following subparagraphs.

In ADS-B and TIS-B extended squitter messages, the TYPE subfield of the “ME” field occupies “ME” bits 1 to 5 (Message bits 33 to 37). The SUBTYPE field, if present for a particular message type, occupies “ME” bits 6 to 8 (Message bits 38 to 40). The “TYPE” subfield, together with the “SUBTYPE” subfield for some message types, is used to identify the ADS-B or TIS-B Message and to differentiate the messages into several message types.

For ADS-B messages (those for which DF = 17, or DF = 18 and CF = 0 or 1, or DF = 19 and AF = 0), the possible message types are those listed in Table 2.2.3.2.2-A. In that table, the word “**Reserved**” indicates ADS-B message types for which the message formats have not yet been defined, but which may be defined in future versions of these MOPS. ADS-B receiving subsystems **shall** use the type code, together with the subtype code if present for a given type code value, to identify the type of ADS-B message being received, in accordance with Table 2.2.3.2.2-A. ADS-B receiving subsystems should not generate ADS-B reports based on the receipt of ADS-B message types that are indicated as “**Reserved**” in Table 2.2.3.2.2-A.

**Table 2.2.3.2.2-A : Determining ADS-B Message Type**  
**(DF = 17, or DF = 18 and CF = 0 or 1, or DF = 19 and AF = 0)**

Type Code ("ME" bits 1-5)	Subtype Code ("ME" bits 6 to 8)	ADS-B Message Type
0	Not Present	<b>Airborne Position Message</b> (§2.2.3.2.3), <b>Surface Position Message</b> (§2.2.3.2.4)
1 - 4	Not Present	<b>Aircraft ID and Category Message</b> (§2.2.3.2.5)
5 - 8	Not Present	<b>Surface Position Message</b> (§2.2.3.2.4)
9 - 18	Not Present	<b>Airborne Position Message</b> (§2.2.3.2.3)
19	0	<b>Reserved</b>
	1 -4	<b>Airborne Velocity Message</b> (§2.2.3.2.6)
	5 - 7	Reserved
20 – 22	Not Present	<b>Airborne Position Message</b> (§2.2.3.2.3)
23	Reserved for Test Purposes	
24	Reserved for Surface System Status	
25 - 27	Reserved	
28	0	<b>Extended Squitter Aircraft Status</b> (§TBD)
	1 - 7	Reserved
29		<b>Aircraft Trajectory Intent and System Status</b> (§2.2.3.2.7.1)
30	0 - 7	Reserved
31	0 -1	<b>Aircraft Operational Status</b> (§2.2.3.2.7.2)
	2 - 7	Reserved

For TIS-B messages (those for which DF = 18 and CF is in the range from 2 to 4), the possible message types are defined in Table 2.2.3.2.2-B. In that table, the word “**Reserved**” indicates TIS-B message types for which the message formats have not yet been defined, but which may be defined in future versions of these MOPS. TIS-B receiving subsystems **shall** use the type code, together with the subtype code if present for a given type code value, to identify the type of TIS-B message being received, in accordance with Table 2.2.3.2.2-B. TIS-B receiving subsystems should not generate TIS-B reports based on the receipt of messages for which the message type is indicated as “**Reserved**” in Table 2.2.3.2.1.8-B.

**Table 2.2.3.2.2-B : Determining TIS-B Message Type (DF = 18, CF = 2 to 4)**

CF Field Value	Type Code (“ME” bits 1-5)	Subtype Code (“ME” bits 6-8)	TIS-B Message Type
CF = 2	Type = 0	Not Present	<b>TIS-B Fine Airborne Position Message</b> (§2.2.17.3.1), or <b>TIS-B Fine Surface Position Message</b> (§2.2.17.3.2)
	Type = 1 to 4	Not Present	<b>TIS-B Identification and Category Message</b> (§2.2.17.3.3)
	Type = 5 to 8	Not Present	<b>TIS-B Fine Surface Position Message</b> (§2.2.17.3.2)
	Type = 9 to 18	Not Present	<b>TIS-B Fine Airborne Position Message</b> (§2.2.17.3.1),
	Type = 19	Subtype = 0	<b>Reserved</b>
		Subtype = 1 to 4	<b>TIS-B Airborne Velocity Message</b> (§2.2.17.3.4)
		Subtype = 5 to 7	<b>Reserved</b>
	Type = 20 to 22	Not Present	<b>TIS-B Fine Airborne Position Message</b> (§2.2.3.2.3)
	Type = 23 to 31	Not Present	<b>Reserved</b>
CF = 3	Not Present	Not Present	<b>TIS-B Coarse Airborne Position and Velocity Message</b> (§2.2.17.3.5)
CF = 4	Not Present	Not Present	<b>Reserved</b> (for TIS-B Management Message)

### 2.2.3.2.3 ADS-B Airborne Position Messages

#### 2.2.3.2.3.1 “TYPE” Subfield in ADS-B Airborne Position Messages

In the case of ADS-B airborne position messages, the message TYPE subfield (§2.2.3.2.2) also encodes the Navigation Integrity Category (NIC, §TBD) and the altitude type (barometric pressure altitude, §TBD, or geometric altitude, §TBD). For surface position messages, the TYPE subfield encodes NIC – but not altitude type, since altitude is not reported in surface position messages.

Detailed definition of the “TYPE” subfield encodings that **shall** be used for ADS-B Airborne Position and Surface Position messages are provided in Table 2.2.3.2.3.1.

*Note: These TYPE subfield encodings are also used in the “ME” fields of the “fine” format TIS-B airborne position messages (§TBD).*

The ADS-B Airborne Position Messages **shall** use only “TYPE” codes 0, 9 through 18, and 20 through 22 as indicated in Table 2.2.3.2.3.1.

**Table 2.2.3.2.3.1: “TYPE” Subfield Code Definitions for ADS-B Airborne Position and ADS-B Surface Position Messages**

Type Code	Format (Message Type)	Horizontal Containment Limit ( $R_C$ ) and Navigation Integrity Category (NIC)	Altitude Type	Notes
0	No Position Information (Airborne Position Message or Surface Position Message)	$R_C$ unknown NIC = 0	Baro Altitude <i>or</i> No Altitude Info	1, 2, 3
5	Surface Position Message (§2.2.3.2.4)	$R_C < 7.5$ m NIC = 11	No Altitude Information	
6		$R_C < 75$ m NIC = 9 or 10		
7		$R_C < 0.1$ NM (185.2 m) NIC = 8		6
8		$R_C = 0.1$ NM (185.2 m) or unknown NIC = 0		
9	Airborne Position Message (§2.2.3.2.3)	$R_C < 7.5$ m <i>and</i> VPL < 11 m NIC = 11	Baro Altitude	5
10		$R_C < 75$ m <i>and</i> VPL < 112 m NIC = 9 or 10		5, 6
11		$R_C < 0.1$ NM (185.2 m) NIC = 8		
12		$R_C < 0.2$ NM (370.4 m) NIC = 7		
13		$R_C < 0.6$ NM (1111.2 m) NIC = 6		
14		$R_C < 1.0$ NM (1852 m) NIC = 5		
15		$R_C < 2$ NM (3.704 km) NIC = 4		
16		$R_C < 8$ NM (14.816 km) NIC = 2 or 3		7
17		$R_C < 20$ NM (37.04 km) NIC = 1		
18		$R_C = 20$ NM (37.04 km) or unknown NIC = 0		
20	Airborne Position Message (§2.2.3.2.3)	$R_C < 7.5$ m <i>and</i> VPL < 11 m NIC = 11	GNSS Height (HAE)	2, 5
21		$R_C < 25$ m <i>and</i> VPL < 37.5 m NIC = 10		2, 5
22		$R_C = 25$ m <i>or</i> VPL = 37.5 m <i>or</i> $R_C$ or VPL unknown NIC = 0		2